

Lipid Self-assembly in Digesting Milk-like Emulsions

Monday, 2 December 2019 15:30 (15 minutes)

Milk is nature's emulsion for delivering fats and fat-soluble nutrients to infants and remains a mainstay of the adult diet thereafter for many. The milk fat globules that deliver these nutrients comprise 98% triglycerides with 400 unique acyl chains esterified onto the glycerol backbones, resulting in thousands of possible unique triglycerides.[1] Digestion of triglycerides into monoglycerides and fatty acids by endogenous lipases breaks down the milk fat globules and allows the absorption of fat-soluble nutrients in the intestines. Small angle X-ray scattering (SAXS) with in situ lipolysis has revealed that the amphiphilic milk fat digestion products spontaneously assemble into a progression of liquid crystalline structures during in vitro lipolysis, with milk from different species yielding different self-assembled structures that are robust to standard processing techniques for milk storage.[2-4] SAXS has also shown that lipolysis can enhance the solubility of crystalline lipophilic drugs in digesting milk and infant formula preparations, which commonly limits their bioavailability.[5-7] We hypothesise that the liquid crystalline structures that form are advantageous for nutrient absorption by each individual species and that controlling liquid crystalline structure formation during digestion is key to nutrient delivery. A key issue in testing this hypothesis is the chemical complexity of the milk fats themselves, making the analysis of chemical-structure-function relationships challenging. This presentation will discuss the lipid liquid crystalline structures formed in a variety of milks and milk-like emulsions during digestion and how they can be mimicked with simplified triglyceride emulsions that provide representative digestive colloid structures through which to analyse the impact of lipid digestion on bioactive delivery. Lipid self-assembly in digesting mammalian milks and milk-like emulsions measured using SAXS will be discussed in the context of their lipid compositions.

References

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- [4] Clulow, A. J. et al. A closer look at the behaviour of milk lipids during digestion. *Chem. Phys. Lipids* 2018, 211, 107-116.
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Level of Expertise

Experienced Researcher

Do you wish to take part in the poster slam

No

Travel Funding

No

Speakers Gender

Male

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